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WHAT IS TO BE THE OUTCOME?*

BY DAVID EUGENE SMITH.

1. Recent experience in certain parts of the country shows that it is not unlikely that, within a few years, students may rather generally, at any rate for a time, be admitted to college without mathematics. This movement is intended to be democratic in its purpose, but it may well be doubted whether it is not more likely to turn out to be a phase of the return to the old aristocracy of education. By depriving students of equal privileges in the way of serious mental work, the danger is the same as that of placing the extremely difficult subject of vocational guidance in the hands of any except a highly trained, highly gifted, and carefully selected group of experts—that of depriving all of equal chance in the race of life. To reduce this danger to a minimum, it is essential that we carefully consider, in meetings of this nature, our attitude in the face of the attacks now being made upon mathematics.

2. The attack upon mathematics in the secondary school has been of two natures:

(*a*) The attack of educators whose powers of speaking and writing lead them to court applause through their cleverness of statement. Men of this type are found in various institutions, and our experience shows that their influence is ephemeral.

(*b*) The attack of more serious scholars who point out the defects in our scheme of mathematics and suggest remedies. These scholars are often found outside our guild, but much more commonly in associations like this which I address. Their purpose being constructive, their influence is certain to be felt.

3. The attack upon mathematics on the ground that it has no general disciplinary value has thus far been abortive, scientifically. We have only to see how divergent are the results of various investigations to see the truth of this assertion. There has been not the slightest proof adduced that mental exercise requiring vigor of thought does not conduce to brain vigor,

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* Read at the spring meeting of the Association.

exactly as physical exercise conduces to bodily vigor. What has been shown is that certain specific claims, rarely made for many years past, seem not to be valid.

4. Whatever may be the future of mathematics, the science will continue to be taught in the secondary schools for many years to come much as it is at present, because of the mere force of inertia if for no other reason. Schools change slowly, and the training of the necessary teachers can proceed only at a certain rate.

5. Referring only to the general type of schools, it would seem that we are tending to a constructive reform from within, somewhat along the following lines:

(*a*) A six-year high school.

(*b*) The first three years will probably offer required courses in mathematics, and the second three years will offer elective courses.

(*c*) The three years of required mathematics, covering the seventh, eighth, and ninth school years, will include applied arithmetic, intuitional and constructive geometry, the uses of algebra, and an introduction to demonstrative geometry and formal algebra. These years will open the door of mathematics, will show its general nature, and will determine whether a student has the mental equipment for the further study of the subject.

(*d*) The three years of elective mathematics, covering the tenth, eleventh, and twelfth school years, will include the algebra necessary for a later study of college mathematics, a reduced number of basal propositions of plane and solid geometry, with plenty of exercises, the essential features of plane trigonometry, arithmetical calculations with logarithms and the slide rule, mechanics or applied mathematics, shop drawings, and the first notions of differentiation and integration.

All this is a mere commonplace in the best European schools, and the outlook is in favor of our adopting the best features there found.

If we can set about to do this work with the same attention to scientific arrangement of matter that characterized our earlier courses, avoiding the pitfalls of a mere notional and unscientific sequence, we shall secure better mathematics than at present, studied with more interest, and at the same time we shall secure a mathematics that is more closely in touch with present life.

6. With this constructive program, there seems little to fear from the present attacks on mathematics. Even aside from the value of the subject per se, which seems somewhat a matter of fashion rather than of scientific decision at present, it does not stand on the same foundation as the classics, since the practical applications of mathematics are multifarious, and we have only to show the lines of these applications to secure a position that is not likely to yield to any such assaults as those which are now being made. Certainly, as compared with any material which is now being offered to replace it, even the classics should have a strong position, but the position of mathematics should be impregnable.

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